

CREPUSCULAR AND NOCTURNAL ACTIVITIES OF  
*PARAPONERA CLAVATA*  
(HYMENOPTERA:FORMICIDAE:PONERINAE)<sup>1</sup>

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ABSTRACT: *Paraponera clavata* workers leave their nest in the early evening, temporarily group in an area near the nest entrance and then commence their foraging individually. Material brought back to the nest is largely sap, although some plant material and insects also are collected. Workers randomly return to their nest throughout the night, the last to return often coming back with no sap or booty.

DESCRIPTORS: Foraging behavior, preforage aggregations, sap feeders, offensive stinging.

The reports of Hermann (1973) and McCluskey and Brown (1972) have pointed out several interesting features on the foraging behavior of *Paraponera clavata* (F). This ant species routinely forages in late evening and during the night. Details of its foraging habits, however, were not explained. It is the purpose of this report to reveal how and when the worker ants leave their nest and what they gather as food between the time they leave the nest in the evening and return to it the following morning.

#### Materials and Methods

Colonies of the ant species *Paraponera clavata* (F.) were found at Limon Cocha, Ecuador (Hermann and Blum, 1966), by following foraging ants. Their nests, always in the ground at a tree base, were marked for further examination.

Nine colonies of ants were carefully watched. Complete data on foraging activity and colony structure were obtained on two of these nests. Ants observed departing from their nests were watched throughout the night on several occasions. Estimations of colony size were later correlated with figures of ants collected while digging up the nest.

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<sup>1</sup> Accepted for publication: January 13, 1975

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## Results and Discussion

Only on rare occasions did a colony of *P. clavata* ever have more than one opening. On occasion there were two openings and both were employed as an exit and an entrance. When two openings were found, it was determined that there also was a connection between the two tunnels within the nest since marked individuals entering one hole often would be found leaving through the other. The entrance hole generally measures about 2 cm in diameter.

Definite foraging rhythms were observed. Commencement of foraging activity was during the crepuscular period of early evening while cessation of foraging activity was during the crepuscular period of early morning. This data correlates well with the data reported by McCluskey and Brown (1972).

An altering of the photoperiod evidently destroys the natural foraging behavior of this species. McCluskey and Brown (1972) destroyed routine foraging rhythms by supplying laboratory colonies with irregular photoperiods. I found an irregularity in foraging behavior on overcast days. When crepuscular conditions were approached, due to decreased illumination on overcast days, foraging went on as it would during the normal foraging period.

### Preforage Behavior

Worker ants began leaving the nest between 4:30 PM and 5:00 PM (Table 1). At times a single individual would leave, while at other times several individuals would depart in single file. Most often these workers stopped in a specific "preforage aggregation" before embarking on their foraging excursions (Hermann, 1973). Such preforage aggregations were not always present (Table 1, October 4, N Ag). When aggregations were present, workers sometimes would remain in them for no more than a few minutes before commencing their foraging activities. On occasions, considerable time was spent by workers in the aggregations.

Based on the findings of Hermann (1973), preforage aggregations may have influenced the acquisition of group raiding behavior. *P. clavata* workers often leave their preforage aggregations in numbers, each individual following the other. This behavior is much like the departure of group-raiding ponerines and dorylines. The difference between *P. clavata* workers and group raiders is in the follow-through behavior in which workers of group raiders remain in groups whereas workers of *P. clavata* disperse shortly after leaving their preforage aggregations.

### Number of Foraging Individuals and Materials Collected

A single nest observed through the night on Sept. 27 represents the general foraging behavior of *Paraponera* workers. Workers began to enter the preforage aggregation at 4:46 PM (see Table 1). Active foraging began at 5:32 PM and essentially ceased the following morning at 5:31 AM. This represented a 12-hour foraging period. Ninety-nine workers were recorded going up the tree from the nest and 84 were recorded to return. The remaining 15 workers drifted in between 5:31 and about 6:30 - 7:00 AM. Of the workers observed, 60 returned to the nest with sap in their spread mandibles (76.9% of the foraging workers), 13 returned with nothing (16.7%) and 5 returned with some sort of prey or solid material (6.4%) (lichen and bark, moth, palm mulch, a jelly-like material from the palm foraged upon and a cockroach ootheca).

The high percentage of sap collected was consistent in all of the colonies observed. Sudd (1967) listed sap collecting as a secondary foraging character of primitive ant species. Of primary importance is predatory and scavenger behavior in the collection of insects. This is not the case with *Paraponera clavata*. Sap appears always to be the primary material brought into the colony.

Interestingly, Krombein (1939) mentions that sap collecting also is demonstrated by tiphiid wasps. It is possible that there is some significance here.

The high number of foraging workers recorded resulted from a return to foraging by workers that came back to the nest either with nothing or with one of the materials listed above.

### Number of Individuals in a Colony

The nest mentioned above in one of the foraging experiments was dissected on October 1. One hundred thirty-one workers and a queen, four alate males, 67 pupae, two prepupae and 55 larvae were taken. Although some ants were probably lost in the digging I feel confident that I got most of the colony. Dissecting a colony of this species is extremely difficult in most cases since the tunnels of the nest intermingle with the roots of the tree. Other colonies at Limon Cocha were estimated as being larger than the ones reported on here and Bequaert (1926) dissected at least one nest with as many as 500 individuals. Mann's estimation of colony size (1916) was

somewhat smaller. He may have dissected a smaller colony or incompletely dissected a larger one. McCluskey and Brown (1972) collected 300-400 workers and observed an additional 100 in the nest site.

Another nest dissected on October 29 had 225 workers, a queen, no alate forms, 46 pupae, two prepupae, 57 larvae and 18 eggs. It is conceivable that a considerable number of eggs were lost in digging out the colony since the nest covers an area of a square meter or more in some cases.

Use of the Lincoln index on foraging workers proved worthless as a means of estimating colony size. The values calculated did not fit the actual colony size and adjustments in Lincoln Index values produced inconsistent results. Colony function probably determines the number of foraging workers at any one time, this number changing upon the changing needs of the colony.

### Additional Behavioral Data

On occasion, workers would accept foreign individuals of their species into their colony. However, in most cases defendent ants would attack and sometimes dismember an intruder ant. The foreign ant would most often assume a passive role, retracting its legs and refusing any altercation with its attackers.

During overcast days, diurnal foraging activity often occurred. However, when it began to rain all foraging activity ceased.

On occasion, insects were offered as prey to *Paraponera* workers. Insects with an obvious odor, such as pentatomid bugs and certain abundant beetles, were rejected by the ants. Other prey items, such as lepidopterous larvae and spiders, were accepted and carried to their nest. Oddly, the ants accepted ithomiid butterflies, insects with well known affinities for distastefulness.

Upon accepting live prey worker ants readily stung them after grabbing them with their large mandibles. This points out the use of the sting in prey capture as well as in colony defense. Prey that offered no resistance to the worker ants were often accepted by the ants without stinging. However, the slightest resistance provoked rapid and efficient stinging.

On occasion, alate forms were seen aggregating at the nest entrance hole just after 7 PM and some alate forms were seen leaving the nests at about this time. Alate forms also were collected at lights at slightly later times. McCluskey and Brown (1972) reported observing a male at 6:30 PM and they collected females at lights. Bequaert (1926) also observed nocturnal flights of males. All evidence, therefore, points to definite nocturnal mating habits of this species.

Table 1. Foraging data of *Paraponera clavata*  
Single Nest

Date of Observation	Time Workers First Seen-PM	Time First Worker Returned to Nest	Highest # of Workers in Preforage Aggregation	Material Collected By Workers
Sept. 24	5:03	6:07	Several	-----
Sept. 25	4:58	5:28	27	insect larvae, spider, sap, nothing
Sept. 27	4:46	5:49	12	lichen, nothing, sap, palm mulch, moth, jelly, cockroach ootheca
Oct. 4	4:30	---	N Ag	-----
Oct. 5	---	---	5	lepid larva
Nov. 7	---	---	56	-----
Nov. 8	5:00	5:46	---	-----
Nov. 8	5:39	6:01	Several	-----
Nov. 12	5:25	5:45	22	-----

N Ag - No aggregation was formed.

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